Hyperbaric Medicine - Creating an Integrated Computer-based System

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BACKGROUND INFORMATION

Once used only for diving injuries, hyperbaric oxygen therapy is now used to treat a variety of medical conditions. The Hyperbaric O_2 (HBO) department maintains a pressurized chamber in which up to 12 patients are treated simultaneously. After being situated in the chamber, patients breathe oxygen at pressures greater than the atmosphere to increase the amount of oxygen in the blood. The elevated oxygen level is used to enhance healing and cell function, combat infection, reduce swelling and build capillaries.

Hyperbaric treatments are used to treat a variety of conditions, including decompression sickness (diver bends), carbon monoxide poisoning, amputation sites, and wound problems.

OBJECTIVES

Prior to implementation of this database system, the HBO department maintained its data primarily through paper documentation, and the use of a large whiteboard to list the patients scheduled to dive that day. Names and times were posted on the board, and, at the end of the day, erased so the next day's schedule could be transcribed. Paper documents were written for dive logs, tender logs, etc. The department experienced the typical problems associated with a manual system, e.g., potential errors in manual calculations and inconsistency in data gathering. We sought to resolve this problem by developing a system which would have the capability to capture all pertinent information via uncomplicated data entry screens, with single-button report generation, and simple utility functions.

Specifically, we sought to:

- share the information department-wide
- emphasize ease-of-use
- ensure the reliability of the data
- allow for ad-hoc reporting
- embed security within the system
- provide easy access to department statistics (patient history, dive log and tender data, etc.)

SOLUTION - PHASE I

We created a three-phased approach to developing the system. The first and most important phase was the analysis, writing, testing and implementation of the base system. The core set of modules included data entry screens, pre-built reports and general utility functions.

The data entry screens allowed users to enter patient demographics, medications and consult data, as well as schedule dives and enter dive information. The pre-designed reports supplied immediate information on the Daily Dive Schedule and Dive Log, as well as Tender and Patient statistics. We also implemented an *ad-hoc* capability, so the user could create and run reports of their own design. Utility functions included screens that allowed (authorized) users to update tables, revise or add security, and change passwords.

Security is built into the HBO system, such that every user has a password, and each user has rights to only certain parts of the system. For example, the department secretary, who keys the patient demographic information, does not have access to the dive log, while the operator who enters the dive log data has read-only access to the patient demographics screen. In addition an audit trail is created from all data entry screens.

We used Microsoft FoxPro, a relational database that possessed cross-platform capabilities, since the department employed both Macintosh and Windows microcomputers. We loaded the system on an existing Local Area Network (LAN) so that everyone could access the same data in a secure environment, with the added benefit of nightly backups.

PHASE II

The second phase of the system involves interfaces with various data repositories within the medical center. These interfaces will download data into the HBO system, instead of relying on departmental data entry. For example, a link to the Pharmacy System will supply the current medications of all active patients. Another link to the Hospital Information System will provide patient demographics. The benefit of this phase is not only a departmental time-savings of data entry, but also a more reliable source of data.

This data linking will be performed nightly by a program that collects the requested data from the appropriate mainframe systems, then updates the HBO databases on the network. In this phase, data in the system will be less than 24 hours old.

PHASE III

The third phase involves real-time SQL lookups into a central clinical repository. In this scenario, the HBO system would be updated from a host Sybase data repository only minutes after new clinical data became accessible.

The benefits of this system are 1) savings in time and money spent in repetitive data entry, and 2) more accuracy and timeliness of report information.

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